Read me!

These notes are for tourism + tectonics for the new elective geography syllabus (2260) 2024 onwards.

These notes do not cover every topic in the syllabus, so please study it alongside the notes given by your school teachers. Some of the information below is not from the textbook as it is given by my own school teachers, do not blindly memorise unless you understand the content well. Thanks and good luck!

PRIME EXAMPLES:

- 1. 2010 Haiti Earthquake (Port-au-Prince)
 - a. Mw7, 220 thousand deaths, 250 thousand houses collapsed (developing country)
 - b. Due to low quality buildings (low-quality concrete), 90% of buildings collapsed
 - i. Due to poor governance and corruption
 - ii. Government priorities economic development
 - c. Monitoring and warning systems malfunctioned
 - i. Country lacks resources and finances to maintain
 - d. Port-au-Prince located on soft soil \rightarrow seismic waves amplified
 - e. Densely populated city \rightarrow more people exposed
 - f. City 25km from epicentre \rightarrow more exposed risk
 - g. Search and Rescue:
 - i. 7 S&R teams deployed, 130 rescued
 - ii. Shortage of ambulances & heavy machinery (delayed time)
 - h. After water supply was disrupted, UNICEF provided clean water, food, shelter and medical assistance
- 2. 2010-2011 Christchurch, New Zealand Earthquake
 - a. 60 thousand buildings damaged
- 3. 2008 Great Sichuan Earthquake
 - a. Mw7.9, 15 thousand landslides, 20 thousand deaths
- 4. 2011 Tohoku Earthquake/Tsunami
 - a. Mw9, 40m tall wave, 18 thousand deaths
 - i. Low deaths despite high magnitude due to Japan's hazard resistant buildings
 - b. Duration of shaking: 6 mins
 - c. Fukushima power plant destroyed \rightarrow radioactive waste
 - d. Warning systems sent out to stop all 19 bullet trains, saving many passengers
 - e. Evacuation: Due to many drill exercises, all 3000 students of Kamaishi city survived as they evacuated to higher grounds
 - f. 500k homeless people were rehoused in settlements with hazard-resistant designs
- 5. 2018 Mt Kilauea, Hawaii Volcano
 - a. 0 VEI, 24 injured

- b. 600 homes destroyed + 1000 hectares of land burned by lava flow
- c. Shield volcano
 - i. Low silica, effusive eruption, broad base, gentle sides, broad summit
- d. Popular tourist destination (Mauna Loa too)
 - i. Total earnings: \$88 million annually, locals have job opportunities
- 6. 2010 Mt Merapi, Indonesia
 - a. 2-3 VEI, 350 people killed, 350k evacuated
 - b. Stratovolcano
 - i. High silica, narrow base, steep sides, narrow summit
 - ii. Not very explosive as gas escapes easily (anomaly)
 - iii. Pyroclastic flow travelled 3km
 - c. Volcano sands mined to obtain material for building construction
 - d. Fertile soil produced for growing rice
- 7. 2010 Chile earthquake
 - a. Me 8.8, 500 deaths although it is a developing country
 - i. Stakeholders put in funds to reduce disaster risk
- 8. 1995 Kobe Japan Earthquake
 - a. Mw 6.9, 6000 deaths, 40k injured
 - b. Time of shaking: 6am
 - c. Densely populated at 3000 ppl per km^2
- 9. 2017 Mt Agung, Indonesia
 - a. High VEI
 - b. Fertile soil: Rice growing in nearby rice fields
 - c. Tourism: scenic landscapes
 - d. Lahars: triggered due to heavy rainfall from typhoon
- 10. 1991 Mt Pinatubo, Philippines
 - a. Respiratory illness, 7 airports closed, destroyed 800km^2 of rice fields
 - b. Winds at 20m/s \rightarrow ashfall and tephra was spread extensively
 - i. 90k hectares of farmland damaged
- 11. Mt Sinabung
 - a. Many settlements within 3km radius (greater exposure)
- 12. 2018 Palu, Indonesia Earthquake
 - a. Mw7.4, 4000 deaths
 - i. Low-lying homes swept away by earthquake and tsunamis
 - b. Tsunami buoys and tidal gauges were not functioning, hence unable to warn people about tsunami beforehand, leading to deaths
 - c. Mental health volunteers counselled children
- 13. Taipei 101 (Taiwan)
 - a. Strong materials, cross braces, dampers to reduce swaying and shock absorbers

- 1. Jaco Island (Timor Leste)
 - a. Exploration: Attractive beaches, scenic views (inaccessible, lacks facilities)
- 2. Nepal
 - a. Involvement: Trek up mountains, Oct to Mar (With peak & off peak seasons)
 - b. Venturers/Adventure tourism: trek up Mt. Everest at 8848m above sea level
 - i. Tourists do not respect the area and pollute, leaving their items on the mountain \rightarrow contaminates soil
- 3. Malaysia \rightarrow Development
 - a. Heavy advertisement, more tourism employment
- 4. Goa (India)
 - a. Consolidation: 7 million tourists vs 1.5 million locals at beaches, 2019 (tourist numbers > local numbers)
 - b. 33% of population relies on tourism for livelihood
- 5. Hawaii (USA)
 - a. Stagnation: 1990-2000, overcrowded, old facilities (peaked, begins to decline)
 - b. After lockdown, locals against opening up Hawaii to tourists
 - i. Tourists do not respect the culture, rules, threatens sense of identity
- 6. Blackpool (UK)
 - a. Decline: 1990, lost appeal due to competition & overcrowding
 - b. Rejuvenation: 2000, renovation & design to be muslim & disable friendly, rebranded (increase in arrivals)
- 7. Singapore
 - a. Sports tourism: SG Grand Prix Formula 1 race every September
 - b. Tourism contributes to 4% of GDP
 - c. Tourism preserves
 - i. Culture found in Chinatown, Little India etc
 - ii. Natural areas → Bukit Timah Nature Reserve (cultural ecosystem services)
 - d. One way flight from SG \rightarrow KL produced 30kg of CO2

- 8. South Korea
 - a. Health tourism: Cosmetic surgery (advanced, short waiting time)
- 9. Machu Picchu (Peru)
 - a. Heritage tourism: lost ancient civilisation

10. Bali

- a. Health tourism: Yoga and wellness spa resorts
- b. 3 million out of 4.4 million work in tourism
 - i. 80% of economy from tourism
- c. Due to covid,
 - i. 2019: 6.3 million tourists.
 - ii. 2020, 2021: hardly any
- d. Tourism industry uses 3 million litres of water per day (for hotels, golf courses)

11. Maldives

- a. 70% of jobs related to tourism
- b. 70% of GDP from tourism
 - i. 1980s was a poor country, but economy has improved due to tourism
- c. 2008, 2009: global financial crisis \rightarrow 4% drop in tourist arrivals
- d. Due to coastal resorts, corals are dying
- 12. Thailand
 - a. 70% of money earned from tourism leaves Thailand
 - b. 12% of GDP from tourism
 - c. 2020: unfavourable political situation \rightarrow protests in Bangkok against military
 - d. Maya Bay:
 - i. Charges US\$12 per visitor to use for conservation of aquatic ecosystems
 - ii. Closed for many months for restoration of damaged corals and marine life
 - iii. Max 375 visitors per day to the beach after reopening, 1 hr duration
- 13. Japan
 - a. 2011: Tohoku earthquake \rightarrow tourists arrivals dropped 65% compared to 2010
 - i. South Korea affected too as less Japanese tourists came
 - ii. Namie became a Fukushima attraction as tourists view abandoned buildings

14. Canada

a. Loss of authenticity: Totem poles mass produced as souvenirs, loses meaning

STAKEHOLDERS

Governments

- Supports tourism expansion as it is vital for Bali's economy
- Establishes policies, creates plans and enforces regulations
- Collaborates with other stakeholders to pool resources to fund for sustainable tourism practices
- Has the ability to improve facilities to prevent overcrowding of tourists & opt for more sustainable facilities
- Bali impose payment of US\$10 per tourist to help find conservation projects
- <u>Environmental</u>: Implements and enforces laws that protect the environment. Tourism revenue used to fund waste management facilities.
- <u>Social</u>: Tax revenue used to build infrastructure & social services (health care & education) in TDR
- <u>Economic</u>: More business & tourists facilities → more job opportunities for locals. With improved facilities, more tourists attracted to come → elevates Bali as TDR
- Poor enforcement due to corruption causes stakeholders to not adhere to rules implemented. Government may tend to prioritse economic benefits more, neglecting environmental & social sustainability

IGOS/INGOS

- Against tourism expansion as it can lead to further environmental degradation
- Has the knowledge, financial and technical expertise to provide assistance to sustainable development which the government cannot do
- INGOs: Bali Starling Conservation Programme
- IGOs: UNESCO initiates People Protecting Programme to inform tourists to protect UNESCO sites eg rice terrace & famous temples in Bali
- <u>Environmental</u>: Loss of biodiversity is reduced as more tourists are informed of preserving natural beauty
- <u>Social</u>: Dilution of cultural heritage minimised as they have to follow 'Global Code of Ethics for Tourism' established by United Nations World Tourism Organisation
- <u>Economic</u>: Local jobs are preserved
- INGOs may lack understanding of local context and hence might have differing views compared to the locals. Most organisations are non-profit hence lack funds to continuously support sustainability projects

Businesses

- Supports tourism expansion as they can gain economic benefits

- Has the incentive to pursue sustainable tourism to keep business profitable
- Has financial resources to pursue sustainable tourism development
- Collaborates with other stakeholders to promote ecotourism
- Bali Bucket List Tours focuses on natural ecosystem and heritage areas
- <u>Environmental</u>: Environment is protected as more businesses are more sustainable
- <u>Social</u>: Cultural heritage is preserved as businesses open up more opportunities to locals
- <u>Economic</u>: As businesses become more sustainable, more tourists are attracted to come, increasing profits
- Businesses tend to prioritise economic profit more → pollutes environment & exploit resources. Causes conflict with other stakeholders due to differing views.

Locals

- Against tourism expansion as it leads to environmental and cultural degradation .
 - Locals will face priced out land & housing, cultural disrespect, noisy & congested streets, pollution
- Locals can seek advice from other stakeholders regarding sustainable tourism and participate in decision making
- <u>Environmental</u>: Environment is protected as more actions are taken
- <u>Social</u>: Local culture is protected eg Bali's rice fields
- <u>Economic</u>: Cost of living for locals will not rise. Locals can find jobs eg organising homestays for tourists
- Due to lack of authority, financial and technical assistance, their efforts may be overruled by the government. Some locals may tend of prioritise economic benefits as they prioritise bringing income for their families

Tourists

- Supports tourism expansion as they can have more travel experiences
- Tourists can develop a genuine interest in TDR and interact responsibly with the environment and people around them
- <u>Environmental</u>: Tourists can avoid improper disposing of waste and learn to responsibility interact with the environment around them
- <u>Social</u>: Tourists can read up on local practices and cultures before going to TDR. Do not mock local culture
 - In Bali, tourists are expected to dress modestly when visiting religious sites
- <u>Economic</u>: Tourists can opt for more sustainable tourism alternatives eg booking a homestay instead of foreign owned hotel chains to support the locals
- Not all tourists are environmentally and socially responsible. Even if they are, some sustainable tourism options might be too costly for some tourists to afford

TOURISM APPROACHES

Ecotourism (Bhutan)

- Takes place in scenic natural areas to allow tourists to experience nature
 - Tours encourages tourists to interact with nature eg trekking
 - Tourists more educated and appreciative of nature
- Aims to conserve natural environment while benefiting local community
 - Tourists partake in homestays hosted by locals
- Encourages small group, high value, low impact tourism
- Economic sustainability:
 - Homestay programmes allow locals to receive direct economic benefits from tourists, earning income → higher standard of living
 - In order to fit the demand of tourists, businesses might hire non-locals who are more trained to work and serve tourists. Causes economic leakage and no income for tourists.
- Environmental sustainability:
 - Government imposes law against killing wolves & wild boars even if they eat crops \rightarrow wildlife protected
 - When tourist numbers increase, greater foot pressure on the environment (soil erosion). Eg if more and more groups trek the same route, more pressure & waste produced

- Social sustainability:

- Homestay programmes ensures preservation of local culture and practices
- Over time when more tourists come, local culture is at risk of commodification and dilution if the locals focus more on economic gains. Eg modifying traditional food and dances to fit preference of tourists

Community Based Tourism (Candirejo village - Java, Indonesia)

- Locals are heavily involved in tourism
 - Participate in decision making for tourism development.
 - All 3 sustainability aspects considered
- Economic sustainability:
 - Locals involved in many jobs to earn income eg homestays, local tours, transport, selling of goods and handicrafts, etc
 - Locals earn direct income from tourists \rightarrow reduces economic leakage

 For locals to do these jobs, training must be provided. However, it is costly to train every local. There is a lack of manpower and funds from government & businesses.

- Environmental sustainability:

- Government forbids major development projects eg hotels and wide roads in the village to protect natural environment
 - Less carbon footprint from vehicles and hotels
- Competition from neighbouring villages are faced. Tourists might choose neighbouring villages with more comfortable accommodation and vehicles
- Social sustainability
 - Locals promote local culture to tourists with traditional art, handicraft, food etc
 - Better appreciation of local culture and preservation in the long run →higher quality of life
 - Over time, these traditional practices might be modified to fit the tourist's preferences. Causing a loss of authenticity and culture.

Pro-poor Tourism (Agra - Uttar Pradesh, India)

- Improves the livelihoods of the poor through training and access to mico-finance
 - Skills training helps locals learn skills for employment
 - Micro-finances given for locals to set up businesses

- Economic sustainability:

- Locals trained in traditional artwork making, allowing them to sell directly to tourists, avoiding the middlemen \rightarrow more profits
- If a foreign company is present, economic leakage may occur
- The poor might be unable to afford/unwilling to attend the training due to lack of confidence
- Environmental sustainability:
 - Environment is kept clean and green
 - When there is an influx of tourists, green efforts are forgotten/unable to be controlled. Causing environmental degradation

- Social sustainability

- Culture preserved as traditional artwork is made and sold to tourists
- Expensive to train all the poor locals. A lot of manpower, resources and time needs to be invested in by the government & businesses.

IMPACTS OF TOURISM

Environmental impacts

Conservation of natural environments & preservation of biodiversity

- Local communities & governments can maintain a pristine environment to attract tourism
- Tourism revenue (eg entrance fees) used to fund protection of ecosystems, protecting biodiversity
 - Establishing protected areas, hiring training staff, environmental programmes
- Bhutan only allows 10-20k visitors each year. Each visitor pays \$250 daily.
- Requires cooperation from multiple stakeholders, money and time. With higher entry fees, some tourists might be deterred from visiting Bhutan. Furthermore businesses might lose customers & revenue.

Restoration of degraded (aquatic & terrestrial) ecosystems

- Tourist sight has potential to be revenue earners, hence restoration carried out
- Stakeholders focus on reforestation/regrowth
- Maya Bay (Thailand) closed for multiple months to allow damaged marine life to recover
- Local businesses and governments lose out on tourism revenue. Requires planning, cooperation and time

Pollution

- Greenhouse emissions
 - Air, sea, land travel involves burning of fossil fuels \rightarrow greenhouse gases
 - Economy class flight from SG to KL generates 30kg of CO2 per passenger
- Inadequate sewage facilities & improper waste waste disposal
 - Tourists leave litter behind \rightarrow environmental degradation
 - *Mt Everest climbers discard tents, food, waste on hill slopes. Chemicals contaminate soil & groundwater*
- Many countries have newly implemented laws which fines businesses for excessive environmental damage
- Many countries eg Australia turning to more green energy harvesting eg solar

Depletion of natural resources & threats to wildlife

- Depletion of natural resources
 - Tourism overuses water \rightarrow depletion of water
 - Bali's tourism industry uses 3 millions litres of water per day (hotels, golf courses,

etc)

- Threats to wildlife
 - Causes by construction of tourist facilities

- Maldives has large scale facilities which threatens coastal environment, corals die due to construction debris
- Many countries have newly implemented laws which fines businesses for excessive environmental damage

Social impacts

Cultural Preservation

- Tourists are interested in places with rich traditional culture and art forms
- Tourism revenue generated can be used to provide incentives to protect traditional art forms
- Boosts local's sense of belonging in the community and quality of life
- Tourists are interested in seeing China's shadow puppetry which passes on history & traditions
 - Innovations were made to attract viewers eg using VR
- However, some places might alter their traditional art form's style and content to suit the preferences of the tourists to attract more to come. This causes cultural dilution

Enhancing cultural ecosystem services

- Environment preservation enhances cultural ecosystem services
- Provides locals with aesthetic, educational, recreational & spiritual benefits
- Bukit Timah Nature Reserve provides people with scenic beauty of flora and fauna; opportunity for education; recreation for trekking/hiking & spiritual benefits when reconnecting with nature. Contributes to sense of place, fosters social cohesion →boosting health & well-being
- Some people take advantage of these areas by polluting it.

Commodification of cultural rituals & art forms

- As demand increases, cultural art forms may be altered and lose their authenticity
- Art forms may be massed produced, losing its meaning
- To attract more tourists, locals may alter the traditional art forms/rituals to entertain guest more (fit their preferences)
- Vancouver, Canada: totem poles are mass produced as souvenirs. Authenticity lost as it is produced without the collaboration of natives
- With the alteration of art forms, more products can be sold to tourists as they are more attracted to it. This allows locals to earn more money and have a higher standard of living.

Cultural clashes

- Tourists are insensitive to cultural norms, causing a negative sentiment towards them by the locals.
- Tourists might mock local culture, not follow basic rules, etc
- Young locals might tend to emulate dressing & moral behaviour of tourists

- Cultural clashes arise due to difference in values, food, language & lack of respect
- Hawaiian locals felt that tourists failed to follow public safety guidelines (wearing mask during COVID-19 period).
- Tourists do not respect indigenous Hawaiian culture→ local's sense of identity threatened
- Not every tourist is disrespectful, some do follow cultural norms and respect locals.

Rise in crimes

- TDRs experience a rise in crimes as tourists carry expensive goods out in public. Making them lucrative targets for pickpocketing.
- Tourists are more relaxed and unaware \rightarrow easily falls victim
- Locals are tempted to steal as they are envious of their wealth
- Tourists in Paris, France are prone to pickpocketing by children in gangs. Tourists persuaded to buy overpriced goods
- Locals can find a way to earn extra money. Tourists can learn to be more careful of their surroundings

Economic impacts

Employment Opportunities

- Diverse jobs created eg (direct) hotels, transport (indirect) construction of buildings
- 10% of global workforce (440million jobs) employed in tourism in 2019
- Employment can be seasonal eg Sapparo Japan is only popular during Winter, workers are jobless during the summer

Income generation

- Generate income for government and locals
 - Tourists spend money on goods: locals earn money
 - Tax revenue from tourism: government earns money
- 70% of Maldives GDP due to tourism industry
- Some tourists may not spend a lot of money on shopping (limited budget)

Economic leakage

- Tourism revenue given to foreign companies rather than locals
- 70% of money earned from tourism leaves Thailand
- Developing countries rely on foreign companies to attract tourists

Overdependence

- Vulnerable to loss of income, lose jobs and livelihood

- Outbreak of diseases, unfavourable political situations, natural disasters, economic downturn

HAZARDS OF VOLCANOES

- All affects human systems & natural systems
 - Destroys properties & infrastructure, human services, ecosystems, causes injuries & death

Tephra

- Ejected material from volcanoes with ash, rocks, etc
- 1991 Mt Pinatubo, Philippines →respiratory illness, closure of airports
- Leads to fertile soil

Landslides

- Downslope movements of rocks and soil that travel long distances
- 1980 St Helens eruption, USA \rightarrow landslide travelled 20km
- Leads to more precious minerals exposed

Volcanic gases

- Toxic gases eg SO2, CO
- 1979, Dieng Volcano Indonesia \rightarrow acid rain, deaths due to excessive CO2
- Regulates climate

Lahars

- Mudflows with ash, water
- 1985 Nevado Del Ruiz, Colombia \rightarrow 20000 people buried, rivers polluted
- Leads to fertile soil + reshapes land

Pyroclastic flow

- Hot flows of ash, rocks, gases
- 10 Mt Merapi, Indonesia \rightarrow forests destroyed, 350 killed
- Leads to fertile soil + reshapes land

Lava flow

- Hot lava travelling long distances
- 2018 Mt Kilauea Hawaii \rightarrow 600 homes destroyed with forests destroyed
- Leads to fertile soil + used as tourist attraction

HAZARDS OF EARTHQUAKES

- All affects human systems & natural systems
 - Destroys properties & infrastructure, human services, ecosystems, causes injuries & death

Ground shaking

- 2010 Haiti \rightarrow water pipes ruptured causing a water shortage, electricity cables snapped
- Allows scientists to predict intensity of future earthquakes and upgrade buildings to improve resilience

Soil liquefaction

- Violent ground shaking causes saturated loose soil to form a think fluid
- 2010/11 Christchurch earthquake \rightarrow biodiversity loss, pollution of water
- Urges engineers to research ground improvement techniques to strengthen soil to handle liquefaction

Landslides

- Violent vibrations loosen rocks and soil, causing it to move downslope
- 2008 Sichuan \rightarrow debris buried villages, forests, polluted rivers
- It can change landscapes and form new habitats

Tsunamis

- Ocean waves caused by underwater earthquakes
- 2011 Tohoku Japan \rightarrow Fukushima destroyed, pollution & services affected
- Tsunamis can spread nutrients from seabed into agriculture areas, increasing soil fertility

BENEFITS OF VOLCANOES

Fertile Soil

- Mt Agung, Mt Merapi
- Soil might be excessively acidic

Tourism

- Mauna Loa, Mt Agung
- Puts tourists in danger

Geothermal energy

- Iceland's electricity from volcanoes
- Needs a lot of money, manpower and time to execute

Minerals

- Mt Merapi
- Workers exposed to toxic chemicals

DISASTER RISKS OF EARTHQUAKES

Nature of Hazard

Duration of shaking

- Longer the shaking, the greater the damage
- 2011 Tohoku \rightarrow 6mins
- It is a force of nature that man has no control over

Time of shaking

- Affects people's alertness
- 1995 Kobe Japan →6am
- It is a force of nature that man has no control over

Vulnerable Conditions

Soil and rock properties

- Loose soil causes soil liquefaction, amplifies seismic waves
- 1995 Kobe Japan →6am
- Urges stakeholders to be more resilient and responsible

Quality of buildings

- Good: Japan Tohoku Mw9 earthquake but only 19000 deaths
- Bad: Haiti Mw7 earthquake with 220000 deaths and 90% building collapsed
- Urges stakeholders to be more resilient and responsible

Exposure

Distance from epicentre

- Shorter the distance, less rocks to absorb seismic energy, hence heavier seismic wave hits the city
- Haiti →25km away
- It is a force of nature that man has no control over

Population Density

- More people, greater exposure to risls
- 1995 Kobe Japan \rightarrow 3000ppl per km²
- It is a force of nature that man has no control over

DISASTER RISKS OF VOLCANOES

Nature of Hazard

Magma composition

- (Shield) Mt Kilauea \rightarrow 700 homes destroyed due to lava flow
- (Strato) Mt Merapi \rightarrow explosive reaction caused strong pyroclastic flow
- Fertile soil

Vulnerable Conditions

Wind conditions

- Stronger the wind, the further the ashfall and tephra is spread
- 1991 Mt Pinatubo \rightarrow winds at 20m/s
- More fertile soil

Availability of water

- More water, more lahars developed

- 2017 Mt Agung \rightarrow lahars due to heavy rainfall from typhoon
- Fertile soil

Exposure

Presence of human settlements

- More people, greater exposure of people at risk
- Mt Sinabung has many settlements within 3km radius
- Fertile soil

COMMUNITY RESILIENCE

Reducing Exposure

Land-use planning

- Higher ground, lower risk of getting swept by tsunami waves
- Japan after 1933 tsunami →disallows the construction of residential buildings near coastal areas (shifted to higher ground)
- Dependent on extent on community's resources

Reducing Vulnerability

Monitoring and warning systems

- Early Earthquake Warning systems (EEW) sends alerts to smart devices
- 2010 Tohoku →early signal sent out to stop all 19 bullet trains, saving lives

Hazard-resistant building designs

- Reduces building collapse
- Taipei 101

Increasing preparedness

Education

- Eg workshops, posters, flyers, lessons in classrooms
- Japan + Taiwan prioritise education →reduces deaths from earthquakes

Evacuation Drills

- Disaster Prevention Day 1 September in Japan
 - Schools and workplaces conduct drills

First Aid Training

- Teaches people to give basic medical care to the injured
- Taught in more developed countries eg Taiwan and Japan

Challenges

Extent of community's resources Capability of community to organise itself for disasters (all refer to Haiti)

DISASTER MANAGEMENT

Disaster Response

Search and rescue

- In developed countries: heat sensors, listening devices, sniffer dogs
- Helps to reduce loss of lives

Timely Evacuation

- To prevent being trapped under buildings
 - Eg 3k students from kamaishi evacuated safely

Social and psychological services

- Provide food, water
- Traumatised victims need counselling

Disaster Recovery

Restoring/improving facilities & living conditions of those affected

- Construction of hazard-resistant buildings

Challenges

Lack of resources (technological and financial) Difficulty in engaging relevant stakeholders to collaborate (all Haiti)